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EXPERIMENTAL ANALYSIS OF FOUR STROKE SINGLE CYLINDER PETROL ENGINE FOR DIFFERENT OPERATING PARAMETERS

Mahendra Kumar Agrawal
Department of Mechanical and Automation Engineering, Amity University Madhya Pradesh , Gwalior, M.P.-INDIA-474002

ABSTRACT
In the world of automobile engineering energy is a most challenging issue. Researchers are focused on various techniques based on energy optimization. All the automobiles run at a particular compression ratio while develop the power so it necessary to analyse the performance parameters of spark ignition engine at different compression ratio while using petrol as fuel.
In this context various parameters of petrol engine such as brake power, specific fuel consumption, break thermal efficiency and volumetric efficiency are analysed by varying compression ratio from 2.5:1 to 10:1 while the applied load is varied from 0.8 to 4.8 kg. Apart from that distribution of chemical energy of fuel into break power, cooling water and exhaust gas is also analysed at different compression ratio and different load.
After completing the experiment on SI engine, experimental evidences concluded that break power and specific fuel consumption are found optimum at higher compression ratio. Apart from above parameters it have also concluded that heat equivalent to BP, heat carried by exhaust gas, heat carried by cooling water and heat unaccounted are also found optimum at higher compression ratio. But total heat input has optimum values at lower compression ratio**.** Another important conclusion has found that the detonation phenomenon of engine occurred at higher compression ratio with hazards noise. In future same experiments may be conducted on SI by using gaseous fuel and blending of alternative fuels with petrol.
Keywords - SI Engine, Compression Ratio, Eddy Current dynamometer, auxiliary head

INTRODUCTION

Efficiency of petrol engine is inversely influence by its compression ratio keeping the value of index constant. By this we can see different variations by manipulating compression ratio. As compression ratio is related to swept volume and clearance volume of cylinder and the fact is that swept volume is constant, so to achieve our objective, variation of swept volume is key work here. This variation has been done by using Variable Compression Ratio Single Cylinder 4-Stroke Engine .In this an
auxiliary head on the cylinder head is provided to vary compression ratio. We are concerned to analyse the different parameters (S.F.C., B.T.E., Vol. Efficiency etc.) of an engine and to find out the optimized result. Heat lost through cooling water and exhaust gas is measured in terms of inlet and outlet by temperature sensing devices like thermocouples etc. In this context comparative analysis of various parameters is done by varying compression ratio at different constant loads.

EXPERIMENTAL SETUP

Following layouts are concerned with the various parts of experimental setup.

Test Rig

Eddy Current dynamometer

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Revolving Auxiliary Head

LIST OF THE INGREDIENTS USED IN THE EXPERIMENT SETUP

1.Fundamental structure	2. Steel frame mountings
3.Variable compression ratio Engine	4.Petrol
5.Electric load panel	6.Tempreture sensing device
7.Tachometer	8.Rotameter
9.Calorimeter	10.Dynamometer

SPESIFICATION OF SI ENGINE USED IN THE EXPERIMET SETUP –

1. Engine Make	GREAVES
2. Engine Sr. No.	G0H 6898076 SPT
3. Engine Variety	Vertical, Single Cylinder
4. Number Of Stroke	Four
5. Rated RPM	3000RPM
6. Compression Ratio	2.5:1 to10:1
7. Stroke	66.7mm
8. Bore	70mm
9. Specific Fuel Capacity	475 g/kwhr
10. Fuel Tank Capacity	5 litre
11.Starting	Rope starting
12. Lubricating Oil	SAE 20W40
13. Cooling System	Air cooling
14. Rated Power Output	2.5Kw

EXPERIMENT METHODOLOGY

Experiment has been conducted on the particular setup by taking the observations such as load, fuel consumption, rpm, water flow rate, suction air flow rate. Inlet, out let temperature of cooling water and exhaust gas has also measured. The observations have been taken at different loads from 0.8 kg to 4.8 kg at a particular compression ratio and likewise all the observations have been taken by varying the compression ratio from 2.5:1 to 10:1.
Following parameters have calculated and analysed on the basis of observations taken during the experiment.

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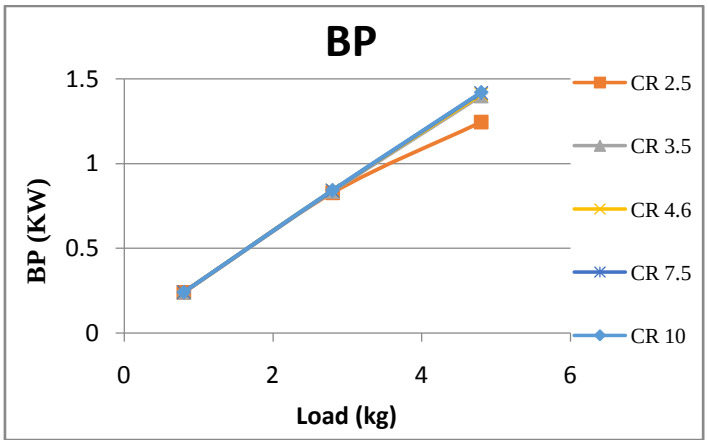
1. Brake power (BP)	**2**.Specific fuel consumption (SFC)
3.Brake thermal efficiency (BTE)	**4**.Volumetric efficiency (η_v)
5. Heat input (H)	**6**. Heat equivalent to BP (H1)
7. Heat carried by exhaust gas (H2)	**8**. Heat carried by cooling water (H3)
9.Heat Unaccounted (H4)	

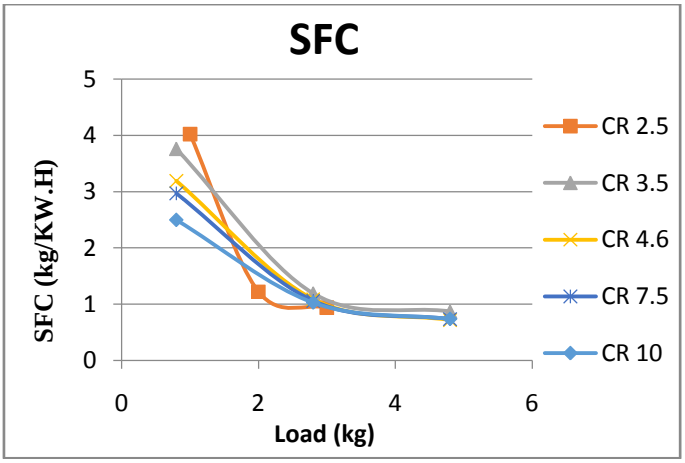
Results and Discussion

On the basis of experimental evidences observed from variable compression ratio petrol engine, following results are obtained.

Variation of Break power with respect to load at different compression ratio.



Variation of Specific Fuel Consumption with respect to load at different compression ratio.



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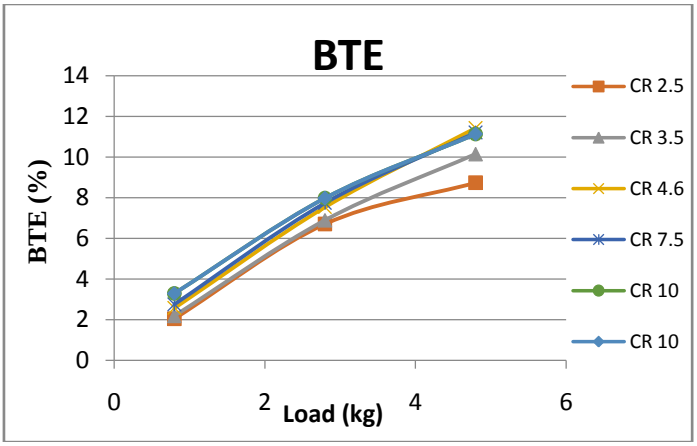
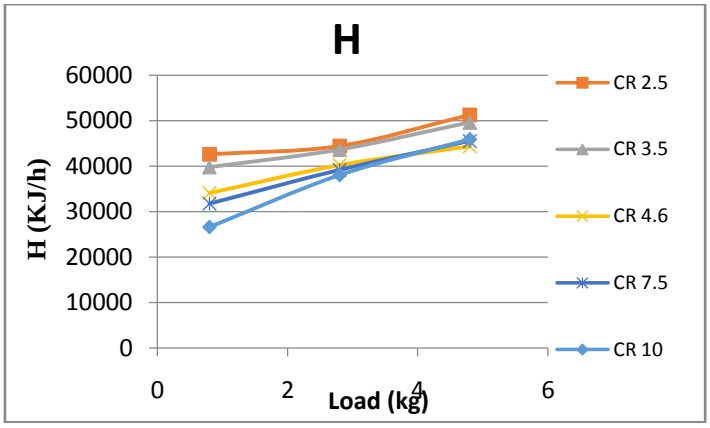
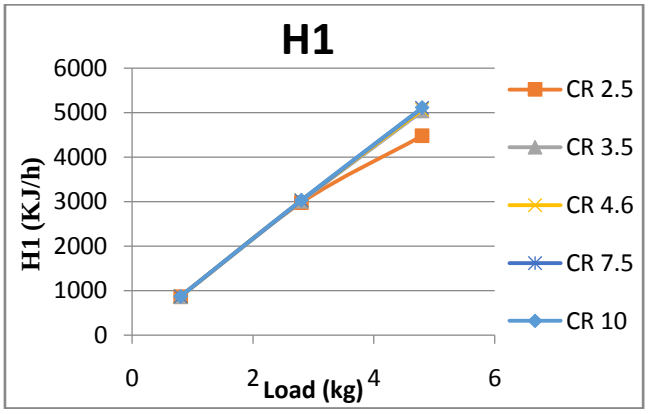
Variation of Brake Thermal Efficiency with respect to load at different compression ratio.



Variation of Total Heat Input with respect to load at different compression ratio.



Variation of Heat Equivalent to Brake Power (H 1) with respect to load at different compression ratio.



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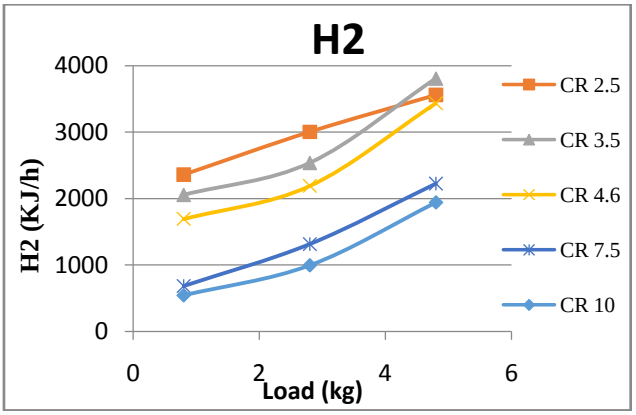
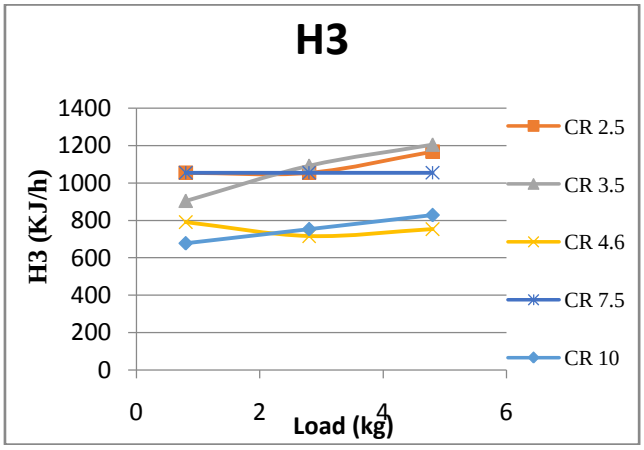
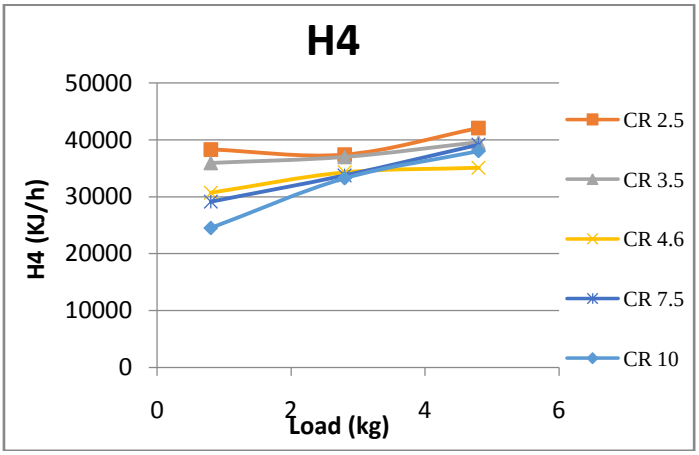
Variation of Heat Carried by Exhaust Gas (H 2) with respect to load at different compression ratio.



Variation of Heat Carried by cooling water (H 3) with respect to load at different compression ratio.



Variation of Heat Unaccounted (H 4) with respect to load at different compression ratio.



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Conclusions

On the basis of experimental evidences and calculations following important conclusions have been drawn.
(a). It have been experimentally concluded that the brake power, specific fuel consumption and brake thermal efficiency are found optimum at higher compression ratio.
(b). Apart from above parameters it have also concluded that heat equivalent to BP (H1), heat carried by exhaust gas (H2), heat carried by cooling water (H3) and heat unaccounted (H4) are also found optimum at higher compression ratio. But total heat input (H) has optimum values at lower compression ratio.
(c). During the experiment one of the important conclusion is also drawn that noise generated by engine is more at higher compression ratio which also signifies higher knocking at the same condition.

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